

CLASS Users Workshop
Space Weather Breakout Group
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Rodney Viereck, NOAA SEC

Usage:

At the present time, space weather data and products are archived at NGDC. They are not yet in the CLASS system.

At the present time, space weather data sets are not large. The Solar X-ray Imager (SXI) is the first large data-rate space weather sensor on any NOAA spacecraft. Future GOES, NPOESS and DMSP spacecraft will have additional imagers and therefore, the space weather data sets will grow substantially.

There are two other developments that will also influence the need and quantity of space weather data in the archives. Now that the Space Environment Center (SEC) has moved into the National Weather Service, it is now required that not only data but also operational model outputs will need to be archived. Space weather forecasting and new products and services require the introduction of much larger global and interplanetary models. Therefore, the amount of space weather model data will increase dramatically in the next decade but I suspect that it will still remain small compared to other users.

The Space Weather Forecast and Analysis Center requires space weather data in real-time (less than 1 minute). Therefore, CLASS will not be the data source for space weather operations. However, in the analysis of particular events, access to historical data will be required to put an event into perspective.

The researchers and model developers at SEC, DOD, NASA, academia, and in industry will need access to complete data records. They will be the primary users of CLASS. They need both the high level validated and processed data as well as access to historical records of the real-time data for model development. It is not yet clear who will archive the real-time data.

Formats:

Space weather data is not yet very large. As long as the applications that are used for reading, displaying, processing, and interpreting the data can deal with the formats that are available from CLASS, there should be no issues. For now, much of the data that we access from NGDC, is in ASCII and FITS formats... CDF and NetCDF are also common formats.

Metadata:

There still is a lot of misunderstanding of what "metadata" is. How broad does the definition go? In addition to the typical, time, geolocation, geomagnetic location, altitude information, space weather data needs to include spatial information for events on the sun (solar lat. lon.) as well as in interplanetary space. As we expand manned spaceflight to Mars, the metadata will need to include coordinate information beyond the sun-earth system. We also need calibration, version numbers and very good error bars or quality flags (for Kalman Filter data assimilation).

APIs:

Some sort of API is very important but more important is good instructions on how to use the APIs. Common calling format for CLASS, NGDC, Real-time (SEC) data would be good. Also, APIs for metadata.

Discovery Tools:

Searching data as well as metadata would be important. These should be both easy to use and multi-discipline. Connecting space weather data to upper atmosphere and climate processes will require access to all sorts of data.

Space weather researchers are data starved. There are few operational sensors that have historical data sets. Therefore, most researchers rely on NASA, ESA and other multinational data sources. A single point access to all space weather data would be very valuable and has been requested often. This would either require that CLASS archive data from not only NASA but also ESA and other satellite programs or provide a link to other data sets.

Documentation:

1. First, good documentation on what the metadata requirements are for CLASS is critical. If data providers are going to efficiently and effectively provide new data for CLASS, it must be as easy as possible for them to put their data in the correct formats. These need to include algorithms, known problems and uncertainties, sources of errors etc...
2. On line documentation would probably be sufficient for most users who access CLASS data
3. Users manuals for the instruments and the data. There needs to be a guideline for data providers so that each instrument/data manual is complete and has a similar look and feel.
4. There might be a need for a subscription service to send notices out to specific users when new data or a new version of data become available.

Reprocessing:

YES! Reprocessing of data within CLASS is an important function. For very large data sets, most providers may not have the ability to efficiently access and reprocess data.

Gaps and Weaknesses:

To make CLASS a highly used and universally accepted data source, it must be filled with critical and complete data that has been validated and verified. In other words, CLASS must provide lots of useful data. To do so, it must entice people to put their data into CLASS. This requires an easy path with few impediments for the data providers.

Of course, once the data are in CLASS, then easy-to-use tools and searchable methods of data access with flexible output formats will be needed. Speedy responses will also be required.

Issues:

1. Space Weather Data needs to be put in CLASS
2. Non-NOAA space weather data should also be considered for CLASS
3. It would be good if CLASS included a complete record of the real-time data

4. Ease of use is important to get people to use CLASS... both ease for the data providers as well as the data users.
5. Meta data and data quality flags and how they are defined. Error bars and uncertainties are important for data assimilation.
6. Inclusion of space weather people at these meetings. It may be better to have a separate users workshop for space weather data.